# Essential tremor: tips and tricks

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## ABSTRACT

Tremors are a common reason for neurology consultations and can sometimes be a diagnostic challenge. One of the most common causes is essential tremor, which needs to be distinguished from other types of tremors, such as those found in Parkinson's disease, cerebellar disease or dystonic tremor. This categorisation is important as their treatment and prognosis differ. This review focuses on two main characteristics of tremor to help with its differential diagnosis: 'The When', or conditions that enhance the tremor, which include action, postural, intentional components and resting tremor; and 'The Where' or the body location, which includes tremor in the upper limbs, head or voice.

## INTRODUCTION

Tremor, the most frequent movement disorder,[1] is characterised by involuntary, rhythmic, oscillatory movements in one or more body parts. Essential tremor (ET) is the most frequent cause of tremor.[2 3] ET is diagnosed clinically. The International Parkinson and Movement Disorder Society (IPMDS) recently established new diagnostic criteria for ET[4] that must be fully met, as well as there being none of the exclusion criteria, to make this diagnosis (table 1).

ET-plus is a new entity, recently introduced.[4] This requires fulfilling the criteria of ET plus having additional features, such as tandem gait impairment, a resting tremor component, subtle dystonic postures, memory impairment or other neurological signs of uncertain clinical significance that are insufficient to establish an alternative diagnosis. However, the diagnosis of ET-plus has been criticised for not considering pathophysiological features or genetic evidence and for neglecting disease progression.[5]

Common causes of misdiagnosis are the classifying of advanced stages of ET as ET-plus (often characterised by the existence of a mild resting tremor component) and the misdiagnosis of ET as a similar condition, such as dystonic tremor, tremor associated with dystonia, enhanced physiological tremor or early parkinsonism.[6]

Dystonic tremor syndromes have classically been divided into dystonic tremor (tremor localised to the body area affected by the dystonia) or tremor associated with dystonia (tremors and dystonia in different parts of the body). The latter offers a greater diagnostic challenge as its electrophysiological and clinical features more closely resemble ET.[7]

Despite ongoing debates and challenges in defining tremor subtypes, the diagnosis of tremors primarily relies on a thorough clinical evaluation.[4] This includes a detailed patient history and a comprehensive neurological examination. While advanced imaging techniques (such as MR scan of brain) and laboratory tests may not always be necessary for the initial diagnosis of ET, they can be crucial in differentiating this from other movement disorders, identifying potential underlying causes of secondary tremors (eg, medication side effects, brain tumour) or assessing for coexisting conditions that may contribute to or worsen tremor symptoms.

This review aims to examine the phenomenology of ET, emphasising the primary features that aid in distinguishing this condition from other tremors (such as Parkinson's disease, other causes of parkinsonism, enhanced physiological tremor, cerebellar tremor and dystonic tremor) for the general neurology audience.[8]

Table 2 summarises the characteristics of the most common pathologies misdiagnosed as ET.

### Neurological examination

Our focus will be on two key aspects that help the diagnostic process. First, we examine when the tremor appears during the evaluation ('The When'). Second, we will examine the body areas that are

**Table 1** Diagnostic criteria for essential tremor

| Diagnostic criteria | Exclusion criteria |
|---|---|
| Isolated bilateral upper limb action tremor | Isolated focal tremor (voice, head) |
| Duration of at least 3 years | Orthostatic tremor with a frequency >12 Hz |
| With or without tremors in other locations (eg, head, voice or lower limbs) | Specific task or position tremors |
| Absence of other neurological signs, such as dystonia, ataxia or parkinsonism | Acute onset and staggered deterioration |

Adapted from [4].
Although this table presents specific criteria for ET, the International Parkinson and Movement Disorder Society suggests a broader approach to the study of tremors. This approach considers both the clinical characteristics of tremor (such as where and when it appears) and its possible causes, allowing the identification of other types of tremor in addition to ET.
ET, essential tremor.

affected by the tremor ('The Where'). Both aspects have significant diagnostic implications.

### The When: action tremor

Tremor in the upper limbs during the execution of an action is the primary characteristic of ET and is included in the current diagnostic criteria.[4] This tremor may be asymmetrical, a feature that does not exclude the diagnosis.

### Kinetic and intentional tremor

The traditional manoeuvres used to assess this are finger-to-nose or pointing-finger tasks. When the tremor develops predominantly at the end of finger-to-nose testing, it is referred to as intentional tremor; if it occurs consistently throughout the movement, it is called simple kinetic tremor (figure 1). Finger-to-nose tremor, in theory, has a cerebellar origin,[9 10] specifically in the cerebellothalamic pathway[4 11]; it occurs in pathologies related to the cerebellum, such as fragile X-associated tremor/ataxia syndrome,[12] multiple sclerosis with cerebellar lesions[13] or ET (28–38.5% of patients)[14 15] but also in toxic peripheral neuropathies.[16] This kind of tremor is not common in Parkinson's disease (4%)[15] so this manoeuvre could help to distinguish Parkinson's disease from ET in some cases.

We also recommend asking the patient to draw an Archimedes spiral[17] to evaluate kinetic tremor. Figure 2 provides example images of the Archimedes spiral across different types of tremors. The patient can either copy a spiral or draw one based on a model. Typically, in ET,

**Table 2** The main features of essential tremor compared with dystonic tremor, Parkinson's disease tremor and exacerbated physiological tremor

| | Essential tremor | Dystonic tremor | Parkinsonian tremor | Exacerbated physiological tremor |
|---|---|---|---|---|
| Predominant type of tremor | Action | Action | Rest | Rest/postural |
| Frequency | 6–12 Hz | 4–7 Hz | 4–6 Hz | 10–12 Hz |
| Amplitude | Variable, but generally low | Variable, but can be high | Variable, but can be high | Variable, but generally low |
| Location | It should affect both arms, but it can also affect the head, voice and legs. | Predominantly in the head and arms. It can affect a single limb. | Mainly in the hands, legs and segmental cephalic segment. | Mainly in the hands and arms. It can also affect the head, legs and trunk. |
| Voice tremor | Continuous | Irregular and task-specific | Infrequent | Infrequent |
| May have postural tremor | Yes | In specific postures | Yes | Yes |
| Re-emergent | No | No | Yes | No |
| Direction of postural tremor | Flexion-extension | Variable | Pronation-supination | Variable |
| Archimedes spiral (action tremor) | With angle | Without angle | It can have an angle. In spontaneous drawing, there can be micrography | No |
| Rest tremor | Rare | No | Yes | Yes |
| Associated with pain | No | Yes | No | No |
| Associated with increased muscle tone | No | Yes | Yes | No |

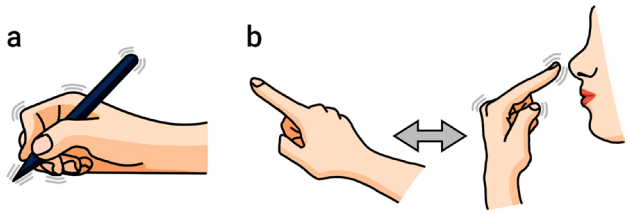


**Figure 1** Example of simple or task-specific kinetic tremor versus intention tremor. (a) Kinetic tremor occurs during a motor task, in this case, writing. This type of tremor can manifest in various activities, but if confined to a specific task, it is considered task-specific kinetic tremor. However, if it occurs in all motor tasks, it is classified as simple kinetic tremor. (b) Intention tremor is illustrated by a finger-to-nose test. This tremor is characterised by worsening as the movement approaches its target and is often associated with cerebellar lesions.

the drawing has an axis between 30° and 60° in the right hand (8–2 o'clock) and between 150° and 120° in the left hand (10–4 o'clock)[18] in 80–85% of the patients[18 19]

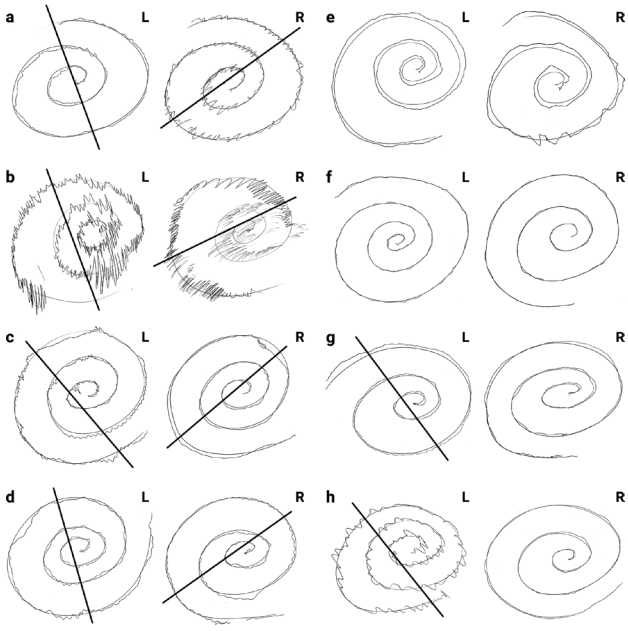


**Figure 2** Archimedes spirals in different tremor types. (a), (b) and (c) Essential tremor; (d) essential tremor plus; (e) dystonic tremor; (f) physiological tremor; (g) Parkinson's disease tremor; and (h) left cerebellar tremor secondary to stroke. The Archimedes spirals show an angle in the essential tremor, essential tremor plus and cerebellar tremor. In contrast, dystonic, physiological and Parkinson's disease tremors do not seem to have an angle. The information provided by the Archimedes spiral is not sufficient to differentiate essential tremor subtypes, and neither does it give a diagnosis alone. The cerebellar tremor shows a similar pattern (but asymmetric because in this case is secondary to an ischaemic stroke) in the spiral as the cerebellum seems to play a crucial role in essential tremor genesis. Axes are included for those spirals where they aid in interpretation. The angle of these spirals can vary based on patient positioning during the test.

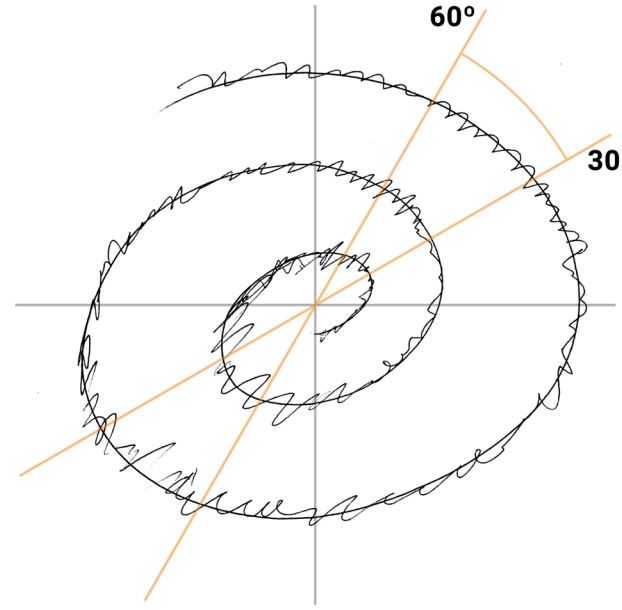


**Figure 3** In Archimedes spirals, the essential tremor shows an angle between 30° and 60° in the right hand and between 120° and 150° (giving a specular image) in the left.

(figures 2 and 3). This correlates with a flexion–extension kind of wrist tremor, which is the most common type.[17] In a large multicohort study, this test was highly sensitive (78.8–97.0%) and specific (95.3%) using as a cut-off point the presence of tremor graded at least as low-to-moderate. Other studies made only with the dominant hand[20] showed lower sensitivity (52.6%) and specificity (75.5%). A recent study showing greater severity in the non-dominant hand[21] may help to explain this.

In contrast to ET, dystonic tremor is typically multidirectional and arrhythmic. This is identified in an Archimedes spiral with an absent axis and an irregular tremor[17] or, if there is an axis (54%), it has a lower amplitude.[19] Moreover, dystonic tremor has several other characteristics that distinguish it from ET. Related to kinetic tremor, this could be a task-specific

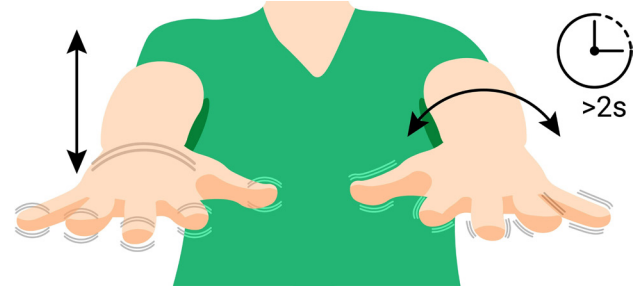


**Figure 4** Postural tremor in ET (left) and PD (right) may present some differences. In ET, the tremor predominantly affects the flexo-extensor muscles of the wrist with minimal involvement of the metacarpophalangeal joints. In contrast, the postural tremor in PD will affect the fingers with flexo-extension movements and the wrist with prono-supination movements. After two seconds, the re-emergent tremor may be present in PD but not in essential tremor.

tremor that occurs primarily when a person performs a particular skilled task (for instance, a tremor occurring while writing or playing an instrument) or the presence of a sensory trick or null point (a specific manoeuvre or position temporarily alleviates the severity of the tremor). Other characteristics related to postural tremor are covered in the appropriate section.

Kinetic tremor occurs in up to 47% of people with Parkinson's disease.[22] The axis in Archimedes' spiral may resemble that seen in ET. To differentiate the two conditions, it is helpful to ask the patient to copy the spiral, as the copy may have a smaller diameter (micrography) and higher spiral spin density (the distance between successive turns is smaller, creating a more compact appearance) or the spacing between consecutive coils is reduced, resulting in a denser visual effect.[23] Note that the presence of kinetic tremor alone does not rule out the diagnosis of Parkinson's disease if it meets diagnostic criteria.

Other techniques used to evaluate the kinetic tremor and its severity include pouring water from one glass to another or bringing a spoon or a glass of water to the mouth. The Fahn-Tolosa-Marin scale, one of the most widely used scales for assessing tremor, usually includes the water-pouring test.[24] These tasks can also help in understanding the impact of tremors on daily activities and considering treatment efficacy and second-line therapies (ie, deep-brain stimulation or MRI-guided focused ultrasound). It is important to note that these scales primarily rate severity and are not intended for diagnostic purposes.

### Postural tremor

Postural tremor is typically examined by asking the subject to maintain a posture with their arms outstretched parallel to the ground and with their palms down (figure 4). This type of tremor is a common diagnostic challenge, particularly if it is associated with ET or Parkinson's disease (figures 5–9 and online supplemental videos 1–5).

**Figure 6** (Video 2) Typically, in Essential Tremor, the postural tremor appears at the same time as the posture is adopted or within 2 seconds after the posture is adopted and usually predominantly affects the carpal joint. The absence of reemergence can help to differentiate it from DP postural tremors. The presence of tremor of similar intensity in the different postures helps us to differentiate it from dystonic tremor.

Re-emergent tremor is an important characteristic of Parkinson's disease. It typically appears after a variable delay while the arms are kept outstretched. Some patients with ET rarely also have this, but with a shorter latency (<2 s).[25] Some patients with Parkinson's disease have a longer latency, with the tremor appearing after 30 s or more.[26]

The direction of the tremor can also help to differentiate between the two conditions, since the postural tremor in ET typically affects the wrist, involving flexion–extension muscles more than the interphalangeal and metacarpophalangeal joints. In contrast, the postural tremor in Parkinson's disease affects predominantly prono-supination muscles with greater involvement of the fingers.[15] This is not always the case, as

**Figure 5** (Video 1) Re-emergent tremor from Parkinson's Disease is characterized by a delay in the onset of tremor after a voluntary movement, typically about 2-5 seconds. It can appear after 30 seconds or more in some patients. Postural tremor in Parkinson's Disease affect more often to the metacarpophalangeal joints.

**Figure 7** (Video 3) Essential Tremor may have a resting component (currently classified as Essential Tremor Plus) presenting, as in postural tremor, a predominant component in flexion-extension of the carpus, as can be seen in the video. In these patients, we will not find re-emergent tremor either. When exploring resting tremor in this posture, it is necessary to make sure that the patient is completely relaxed since if not, we may be seeing the postural component of the tremor.

**Figure 8** (Video 4) Dystonic tremors syndromes can have a resting, postural, and action component. Resting tremor may be indistinguishable from tremor that may occur in patients with Parkinson's disease, involving the metacarpophalangeal and first finger. Postural tremor, as in essential tremor, is not usually re-emergent. Note the dystonic posture on the left arm is not present in the right one. Video 10 shows a dystonic voice tremor in this patient. The presence of obvious dystonia in the buccal cords and in the left arm rules out the diagnosis of essential tremor although without this it could be classified as essential tremor plus.

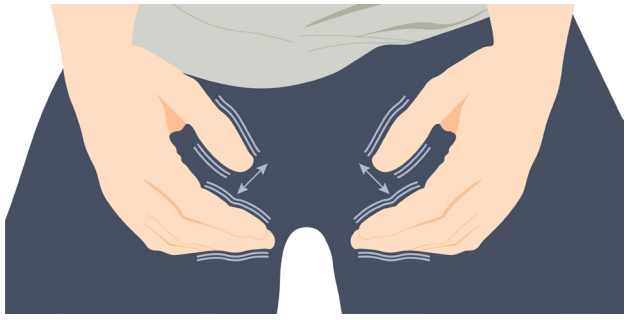

**Figure 11** Resting tremor with involvement of the thumb and the metacarpal-phalangeal joints, called pill-rolling tremor, characteristic of PD. However, it is also present in diseases like SWEDD (Scans Without Evidence of Dopaminergic Deficit).

**Figure 9** (Video 5) Rest and postural tremor in myoclonic tremor. At rest, myoclonic tremor, in this case lithium pharmacological tremor, can affect the thumb but also other joints. The postural component does not have a delay in the onset and can affect both the carpus and the metacarpal phalangeal joints. The primary key to differentiating it in the examination is the irregularity of the tremor.

**Figure 10** (Video 6) In dystonic tremors, we can observe slight dystonic postures of different parts (in this case, flexion of the third finger), and sometimes, we can observe the null point, in which no tremor is observed. In this video, it can be seen with carpal extension (in the opposite direction to the affected movement), the tremor increases while this effect is not so marked in flexion. Irregular frequency (jerky) can also be observed.

Parkinson's tremor can also affect the wrist in severe stages with a flexion–extension component.

For a low-intensity tremor, in addition to the traditional arms outstretched manoeuvre, it can help to place a sheet of paper on the hands to magnify the effect of the tremor. In cases of exacerbated physiological tremor, the examiner can add a weight to the examined limb to reduce the tremor.[27 28]

Other variations, such as keeping the hands facing each other in front of the chest or at different positions, can help to identify two features typical of dystonic tremor. First, the null point (figure 10 and online supplemental video 6) where the tremor decreases or even temporarily disappears (this happens when the body part is placed at the maximum distance possible in the direction of the dystonic movement), and second a posture-specific tremor.[15 25] This posture might also trigger wing-beating movements typical of advanced Wilson's disease tremors.[29]

Cerebellar diseases may also manifest with a postural tremor. This type of tremor can present more variably and is often associated with other cerebellar signs such as ataxia or hypotonia. However, it can be the first and sole manifestation in some spinocerebellar ataxias[9] and can be indistinguishable from the postural tremor of ET.

Cerebellar postural tremor that affects the neck, shoulders and trunk as well as the extremities is termed 'cerebellar axial postural tremor'. Although ET may have an axial component, predominantly cephalic and in voice, the cerebellar axial postural tremor characteristically has a slower frequency than ET,[30] even though the frequency in the upper limbs is not discriminative.[30] Some studies suggest that people with ET have a dorsal and lumbar tremor, detected through accelerometry. While clinically indistinguishable on examination, it does seem to relate to problems of instability.[31]

**Table 3** The most frequent form of expression of metabolic alterations has been reflected. There are described cases of other types of tremors, so extensive research is recommended depending on the clinical context of the patient. It is recommended to perform a study of blood glucose, thyroid, kidney function, liver function, ions including calcium and magnesium, ceruloplasmin, venous blood gases, blood count, electrophoresis, vitamin $B_{12}$, folic, syphilis serologies, HIV, borreliosis. More extensive studies such as drug levels in blood or paraproteinaemias are recommended depending on the patient's clinical profile

| Cause | Action | Rest | Postural | Myoclonus |
|---|---|---|---|---|
| Hypoglycaemia | ✔ | × | ✔ | ✔ |
| Hyperthyroidism | ✔ | × | ✔ | ✔ |
| Catecholamines | ✔ | × | ✔ | × |
| Hyperuricaemia | × | × | ✔ | × |
| Hyperammonaemia | × | × | ✔ | ✔ |
| Hyponatraemia | × | × | ✔ | ✔ |
| Hypercalcaemia | ✔ | ✔ | ✔ | × |
| Hypomagnesaemia | ✔ | × | ✔ | × |
| Hypermanganesaemia | × | ✔ | × | × |
| Wilson's disease | ✔ | ✔ | ✔ | × |
| Hypercapnia | ✔ | × | ✔ | ✔ |
| Vitamin $B_{12}$ deficit | ✔ | × | ✔ | × |
| Folic acid deficit | ✔ | × | ✔ | × |
| Vitamin E deficit | × | × | × | ✔ |

Adapted from [54–57].

The absence of re-emergence in postural tremor can help to differentiate cerebellar positional tremor from other conditions such as Parkinson's disease, but not from essential postural tremor.[32]

#### The When: resting tremor

Resting tremor is typical of Parkinson's disease. Nonetheless, it occasionally develops in other types of tremor, such as dystonic tremor, Holmes tremor[33] or ET, where 20% of patients can have a resting component.[34] To explore a resting tremor, the patient's arms should be relaxed and supported against gravity.[35] They are usually asked to keep their hands on their lap in medium pronation, with the thumb on top (figure 11, figures 7, 8 and 10 and online supplemental video 3, 4 and 6) or sitting on a chair with armrests and hands hanging off the support. Although this is usually sufficient, patients may involuntarily inhibit the tremor when they feel observed. Therefore, distraction manoeuvres may be necessary, such as saying the months of the year or days of the week backwards and counting backwards, among other techniques.

In this position, finding a pill-rolling tremor or thumb tremor would suggest Parkinson's disease (figure 12 and online supplemental video 7) or, more rarely, SWEDD (scans without evidence of dopaminergic deficit),[36] a controversial entity presenting with signs similar to Parkinson's disease but without dopaminergic deficit on molecular imaging studies ($^{123}$I-ioflupane Single Photon Emission Computed Tomography Dopamine Transporter Imaging).

Other manoeuvres might seem less sensible[37] but can help to trigger a resting tremor. The first one is having the patient lying down in decubitus, with their hands resting at both sides; the second one is to ask the patient to walk normally on a hallway (figure 13 and online supplemental video 8). This way, it is possible to evaluate resting tremor in the limbs alongside other gait characteristics, such as reduced arm swing, festination or postural disturbances in the trunk. The frequency of the resting tremor is another feature that can help distinguish between causes: ET has a frequency of 6–12 Hz, while in Parkinson's disease it is 4–6 Hz. In the clinical setting, it is generally not possible to differentiate between different types of tremors based solely on frequency, except perhaps in cases of myorhythmia (<4 Hz) and orthostatic tremor (>12 Hz).[38] When we observe an irregular frequency, we must consider a dystonic or myoclonic tremor (figure 9 and online supplemental video 5). Myoclonic tremor is frequently caused by drugs or metabolic alterations, and less frequently by neurodegenerative diseases or infections. Tables 3 and 4 give the differential diagnosis of secondary causes of tremors.

The presence of resting tremor makes it mandatory to rule out the presence of bradykinesia and rigidity when making a differential diagnosis with Parkinson's disease.[39] The muscle activation pattern measured with needle electromyography differs between patients with ET and resting tremor and patients with Parkinson's disease: the simultaneous contraction of agonist and antagonist muscles is a consistent pattern in ET, while an alternating pattern occurs in Parkinson's disease.[39]

**Table 4** The type of tremor that may appear as a side effect or symptoms of toxicity of different drugs or substances. Note that myoclonus can manifest as irregular tremor. The table includes the most common drugs, but many other molecules can cause tremor

| Drug | Examples | Action | Rest | Postural | Myoclonus |
|---|---|---|---|---|---|
| Sympathomimetics | Salbutamol, terbutaline, albuterol | ✔ | × | ✔ | × |
| Bronchodilators | Theophylline | ✔ | × | ✔ | × |
| Caffeine | Caffeine | ✔ | × | ✔ | × |
| Stimulants | Methylphenidate, amphetamines | ✔ | × | ✔ | × |
| | Cocaine | ✔ | ✔ | ✔ | × |
| Anti-depressants | Ethanol | ✔ | ✔ | ✔ | × |
| Corticosteroids | Prednisone, dexamethasone | ✔ | × | ✔ | × |
| SSRI anti-depressants | Fluoxetine, sertraline, escitalopram | ✔ | In serotonin syndrome | ✔ | × |
| Tricyclic antidepressants | Amitriptyline, nortriptyline | ✔ | × | ✔ | ✔ |
| Mood stabilisers | Lithium | ✔ | ✔ | ✔ | ✔ |
| Typical antipsychotics | Haloperidol, chlorpromazine | × | ✔ | ✔ | × |
| Atypical antipsychotics | Risperidone, olanzapine, quetiapine | × | ✔ | ✔ | × |
| Antiemetics | Metoclopramide | ✔ | ✔ | ✔ | × |
| | Cimetidine | ✔ | × | ✔ | × |
| Opioids | Morphine, fentanyl | × | × | × | ✔ |
| Anaesthetics | Lidocaine | × | × | × | ✔ |
| Antiseizure medications | Valproate | ✔ | ✔ | ✔ | ✔ |
| | Carbamazepine | × | × | × | ✔ |
| | Phenytoin | ✔ | ✔ | × | ✔ |
| Antiarrhythmic | Procainamide, quinidine | ✔ | × | ✔ | ✔ |
| | Amiodarone | ✔ | ✔ | ✔ | ✔ |
| Immunosuppressive agents | Cyclosporine, tacrolimus | ✔ | × | ✔ | ✔ |

Adapted from [58–62]. Selective Serotonin Reuptake Inhibitor (SSRI)

**Figure 12** (Video 7) Resting tremor in Parkinson's disease has classically been called "pill-rolling tremor." It is produced by the involvement of the metacarpophalangeal joints with the participation of the thumb. To properly examine the resting component of tremor, the patient must have their arms relaxed and supported against gravity. This can be obtained with the arms resting in the lap, sitting in a chair with armrest or lying down with the arms on the bed next to the side.

This co-contraction differs in dystonic tremor, where there is an increase in the magnitude of intermuscular coherence between pairs of antagonist muscles, particularly during writing. This coactivation pattern does not occur in patients with ET or in those with tremor associated with dystonia.[7]

### The Where: cephalic tremor

Cephalic tremors occur in 15–55% of patients with ET.[40] The most frequent direction is mixed or round–round (55%), followed by horizontal or no–no (27%) and finally, vertical or yes–yes (18%).[41]

Head tremors may also be present in Parkinson's disease or cervical dystonia.[42] To start the examination, we must observe the patient at rest and assess the location of their tremor. Holocranial tremor (involving the entire head) is more typical of ET or dystonia, while

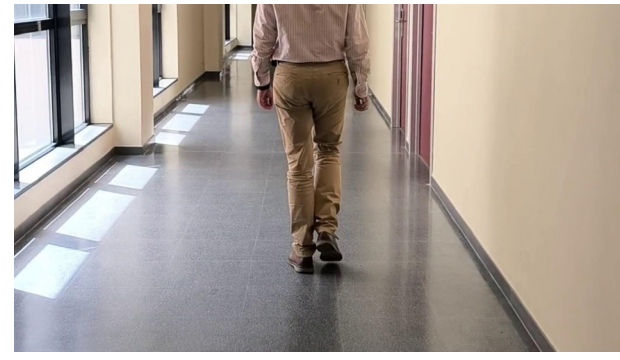

**Figure 13** (Video 8) Hand tremor during gait is a type of resting tremor that typically occurs in Parkinson's disease.

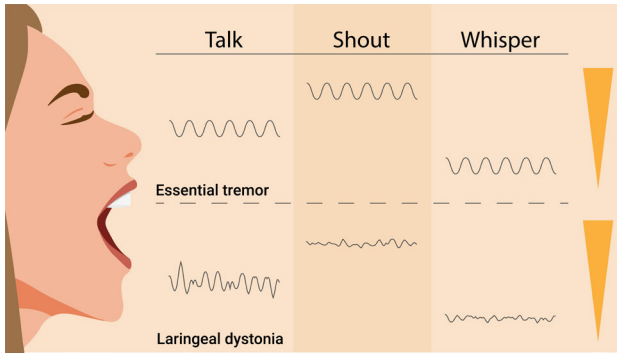


**Figure 15** Voice tremors associated with ET are typically constant and rhythmic. It can be more evident by asking the patient to make a sustained vowel sound and not modify it with shouting or whispering. By contrast, the dystonic voice tremor can be more irregular with some pauses and varies with the task or the volume.

**Figure 14** (Video 9) In cephalic tremor, it is essential to observe whether there are dystonic postures in the primary position (in this case, slight right torticaput and left laterocollis) and how the tremor varies in the different postures. In this video we can see how the tremor slightly increases with the turn to her right and with neck flexion but, one of the cardinal features that classifies this tremor as non-TE is the absence of upper limb tremor.

segmental tremor (mandibular, lingual and chin) is more typical of Parkinson's disease.[42]

The next aspect to observe is the presence of abnormal postures of the neck (torticollis, laterocollis, anterocollis or retrocollis) or head (torticaput, laterocaput, anterocaput or retrocaput). These are more typical of dystonic syndromes, but we must also be attentive to other parkinsonism-related features, as anterocollis or even a drop head can be present in Parkinson's disease[43 44] and in atypical causes of parkinsonism such as multisystem atrophy.[43] Be aware that in cervical dystonia, there may not always be an abnormal head/neck posture, and up to 25% of patients may have upper limb tremor, which can further complicate the diagnosis.[45]

To end, we recommend investigating the amplitude of tremors in various postures. Dystonic tremor tends to intensify when the affected muscles are involved in a movement, which is not the case in ET (figure 14 and online supplemental video 9). A manoeuvre that can help in ET is to ask the patient to lie down so that the movement should reduce or disappear.[46]

When dealing with segmentary tremors, we must also examine them in different ranges of motion, such as the degree of jaw opening or lingual protrusion, to determine if there is a resting, postural or kinetic component.[42] It is important to pay close attention to mandibular tremors in these areas, as they may indicate Parkinson's disease. A tremor that disappears during an action might suggest Parkinson's disease.

### The Where: voice tremor

Voice tremors are commonly associated with ET, but they can also indicate the presence of laryngeal dystonia or spasmodic dysphonia (figure 15, figure 16 and online supplemental video 10). Voice tremor associated with ET is typically constant and rhythmic. They become more noticeable during sustained vowel pronunciation, in contrast to the irregular pauses observed in laryngeal dystonia, which do not correspond to breathing and decrease during vowel pronunciation. Dystonic voice tremors can also be task-specific, disappearing during other activities, such as singing, crying or whispering.[47]

When examining voice tremors, we may ask the patient to repeat phrases with many vowels or to sustain a vowel while varying the volume (from loud to whisper). ET should become more apparent during sustained vowel pronunciation and with changes in volume, in contrast to dystonic tremor.

In cases of spasmodic dysphonia with abduction, which is less frequent than adduction dystonia, there is a failure of vocal cord closure due to hyperactivity of the posterior cricoarytenoid muscle. This results in whispers interspersed with normal speech and airflow disruptions, making it unlikely to be confused with a voice tremor or ET.

**Figure 16** (Video 10) Voice tremor is more typical of patients with essential tremor or dystonic tremor. Typically, the voice of the patients with essential tremor presents a rhythmic tremor independent of volume. In contrast, in patients with dystonic voice tremor, the sound will be irregular, with abrupt stops of the voice, and may vary in intensity at different volumes or tasks.

### Other useful tips

The diagnosis of ET does not need additional tests, but it is routine to screen for metabolic causes (table 3) given the high frequency of occurrence in the general population. In addition, it is important to note treatment with certain medications (table 4) that may cause tremors. Imaging using MRI or DAT-SCAN may be appropriate for cases with atypical presentations, diagnostic doubts or abnormal evolution. Imaging findings compatible with other tremor causes may exclude the diagnosis of ET.

It is important to note that the same patient may have multiple tremors, for example, it is patients with ET possibly have an increased risk of developing Parkinson's disease.[48] Some patients with ET have resting tremor, especially those with advanced disease[49] and some with Parkinson's disease have an action tremor.[50] In these cases, it is necessary to determine which is the predominant tremor to help guide us in the diagnosis. In patients with coexisting different types of tremor, we should not rule out diagnoses without conducting the appropriate complementary tests.

Orthostatic tremor is typically a separate condition that mainly affects the lower limbs when patients are standing, and with a high frequency (>12 Hz). Besides the legs, there are sometimes tremors in other areas, such as the hands, cranial muscles and even the trunk. Patients with primary (idiopathic) orthostatic tremor may be divided into those with and those without a postural arm tremor. The postural tremor is similar to that in patients with ET. Indeed, the tremor becomes apparent when the patient maintains their arms outstretched against gravity in front of their body (eg, extending the upper limbs horizontally). It typically has a frequency of 5–10 Hz, which overlaps with the frequency seen in ET.[51]

Functional tremor is another potential diagnostic challenge. Signs that might suggest this include a decrease or disappearance of tremor when performing distractive manoeuvres or ballistic movements with the opposite limb[52] or synchronisation of the tremor when performing repetitive movements with the other hand.

Holmes tremor is less likely to be mistaken for ET, as it typically appears abruptly or develops rapidly due to an injury, usually in the midbrain/thalamus. It has resting, kinetic and postural components but with a constant frequency (4–6 Hz), typically lower than ET, and is more markedly asymmetrical.[53] This type of tremor usually does not have a re-emergent component like Parkinson's disease tremors, but there is a progressive worsening with the maintained posture that is not present in the ET.[53]

## CONCLUSION

ET is a common condition and is frequently the reason for neurology consultations. Since its diagnosis is clinical, a proficient neurological examination is important to provide the most appropriate treatment for a patient's condition.

While table 1 specifies the diagnostic and exclusion criteria for ET, it is important to recognise that there are other types of isolated tremors that do not fit this classification. The IPMDS[4] offers a more comprehensive classification that includes various tremor syndromes, considering both the clinical features and possible causes. It is important to consider the possibility of other tremor syndromes, such as isolated focal tremors (voice, head), orthostatic tremors or task-specific tremors, which may require different approaches.

The most informative examination tasks are evaluating the kinetic component with Archimedes spirals and postural manoeuvres. Assessing when and where the tremor occurs will help determine the most likely cause. However, if the tremor appears in other locations, additional manoeuvres may be needed to confirm the diagnosis.

Finally, it is important to remember that assessing a patient with tremor requires a complete neurological examination. This goes beyond simply examining the tremor; it also involves evaluating the cerebellar and extrapyramidal systems to guide the diagnostic process.

### Further reading


- Alty J, Cosgrove J, Thorpe D, *et al*. How to use pen and paper tasks to aid tremor diagnosis in the clinic. *Pract Neurol* 2017;17:456–63. doi: 10.1136/practneurol-2017–001719
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### Key points

- Essential tremor is a bilateral action tremor in the upper limbs, which can be associated with tremors in other locations, such as the head or the voice.
- Dystonic tremor is often unilateral and arrhythmic and worsens with postures involving the affected muscles.
- The postural tremor of Parkinson's disease includes the phenomenon of re-emergence, usually after 2 s.
- Abnormal head/neck posture can indicate a dystonic tremor, while cephalic segmental tremor can indicate Parkinson's disease.
- The presence of slow axial tremor or cerebellar signs suggests a cerebellar origin of the tremor.
- The voice tremor in essential tremor is typically rhythmic, increased with vowels and sustained by whispering, crying or screaming.

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